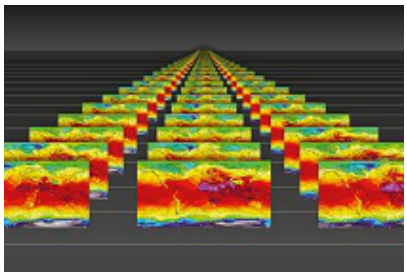

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Extratropical prediction skills of the subseasonal-to-seasonal (S2S) prediction models

The extratropical prediction skills of the subseasonal-to-seasonal (S2S) prediction models are evaluated by analyzing the nine models, which participated in the S2S prediction project, for the common reforecast period of 1999-2010. Based on mean squared skill score (MSSS) of geopotential height poleward of 30°, overall prediction skill and its inter-model spread are quantified to be 9.92 ± 1.94 days at 500 hPa but 11.22 ± 4.16 at 50 hPa in the northern extratropics. An enhanced prediction skill in the stratosphere is mainly due to the wintertime polar vortex. In summer season, stratospheric prediction skills are comparable to or even worse than tropospheric prediction skills. A poor prediction skill in the summer stratosphere, however, is not physical but largely caused by inclusion of weak internal variability in MSSS computation.
It turns out that model errors in both the troposphere and stratosphere are primarily caused by eddy errors rather than zonal-mean flow errors. In particular, the eddy errors associated with eddy phase difference are key factors. This result may suggest that S2S prediction could be improved by better representing wave propagation in the zonal and vertical directions. A strong linear relationship between stratospheric and tropospheric predictions skills in the winter hemisphere further suggests that the tropospheric prediction could be improved by better constraining stratospheric circulation in the model.

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